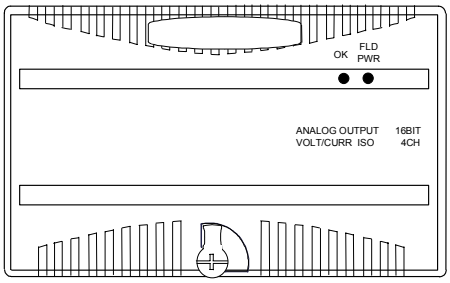
Analog Output Module, 16-Bit, 4 Isolated Outputs

October 2008 GFK-1559D

Product Description

Analog Output Module IC200ALG331 / BXIOAO4215 with 4 isolated outputs is an intelligent module that controls to up to 4 analog devices.



In current mode, a separate power supply may be required for isolated outputs.

Module features include:

- Four isolated 4-20mA current output channels
- Software configuration, no jumpers or switches
- Sixteen bit converter resolution
- High accuracy factory calibration

The following features are software-configurable:

- Per-channel selection of 4-20mA current or +/–10V voltage outputs
- Selection of default/hold last state operation
- Per-channel selection of default values
- Per-channel selection of under-range and over-range diagnostics levels
- Per-channel selection of alarm levels
- Per-channel scaling
- Field re-calibration on command

Host Interface

The module receives 4 words of analog output data from the system.

Diagnostics

The module reports High/Low Limit, Over/Underrange, Open Wire, Loss of Field Power Supply, and Non-volatile memory fault diagnostics.

LED Indicators

The green FLD PWR LED indicates the presence of both logic power and field power for the analog field-side circuits. It does not indicate the presence of other supplies such as current loop supplies on output points. The absence of either backplane or field power turns off the FLD PWR LED.

The OK LED indicates module status:

- On green indicates normal operation.
- Flashing green indicates boot mode or update
- Flashing amber indicates self-diagnostic error.
- Off indicates no 3.3V power

Note that this module is the only one that has its OK LED located before the FLD PWR LED in the A slot.

Module Characteristics	
Channels	4 outputs
Module ID	FFFF9805
Isolation: User input to logic (optical) and to frame ground, Group to Group Channel to channel	 250VAC continuous; 1500VAC for 1 minute Not applicable 250VAC continuous; 1500VAC for 1 minute
LED indicators	FLD PWR LED indicates the presence of both logic power and user power. OK LED indicates module status.
Backplane current consumption	5V output: 10mA maximum. 3.3V output: 115mA maximum
Configuration parameters	Output default
External power supply: Range Current consumption	 +18 to +30VDC including ripple 100mA maximum plus load currents
Thermal derating	None
Diagnostics	High/Low Limit, Over/Underrange, Open Wire, Loss of Field Power Supply, Non-volatile memory fault
Output Characteristics	
Output operating range	Current mode: +1 to 20mA Voltage mode: +/-10VDC
Accuracy at 25 degrees C	+/- 0.1% maximum of full scale
Temperature coefficient	Current mode: 45ppm/°C typical, 90 ppm/°C maximum Voltage mode: 30ppm/°C typical, 60 ppm/°C maximum
Load characteristics	Current mode: 0 to 1250 ohms Voltage mode: 2K ohms minimum
Analog Resolution (1LSB)	Current mode: 381 nA nominal Voltage mode: 381 µV nominal
Update rate	7mS maximum
Channel-to-channel crosstalk rejection	70dB minimum
Output default	Hold Last State (default) / 0 (configurable)

Preinstallation Check

Carefully inspect all shipping containers for damage. If any equipment is damaged, notify the delivery service immediately. Save the damaged shipping container for inspection by the delivery service. After unpacking the equipment, record all serial numbers. Save the shipping containers and packing material in case it is necessary to transport or ship any part of the system.

Installation in Hazardous Locations

- EQUIPMENT LABELED WITH REFERENCE TO CLASS I, GROUPS A, B, C & D, DIV. 2 HAZARDOUS LOCATIONS IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, D OR NON-HAZARDOUS LOCATIONS ONLY
- WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2;
- WARNING - EXPLOSION HAZARD - WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES; AND
- WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.

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Field Wiring Terminals

Terminal assignments for the module are shown below.

Number	Connection	Number	Connection
A1	No connection	B1	I1+
A2	Shield Ground	B2	I1-
A3	No connection	B3	V1+
A4	Shield Ground	B4	V1-
A5	No connection	B5	I2+
A6	Shield Ground	B6	I2-
A7	No connection	B7	V2+
A8	Shield Ground	B8	V2-
A9	No connection	B9	I3+
A10	Shield Ground	B10	I3-
A11	No connection	B11	V3+
A12	Shield Ground	B12	V3-
A13	No connection	B13	I4+
A14	Shield Ground	B14	I4-
A15	No connection	B15	V4+
A16	Shield Ground	B16	V4-
A17	No connection	B17	DC -
A18	No connection	B18	DC+

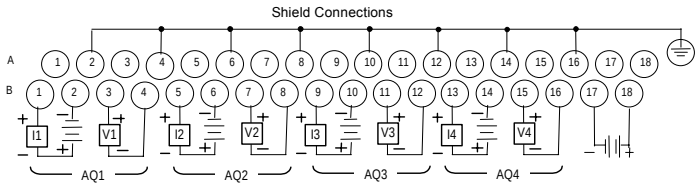
A 24 volt power supply must be connected to B17 and B18 to operate the module.

Voltage outputs are powered from the module. For each channel, V+ is positive with respect to V- when the channel's output data is positive.

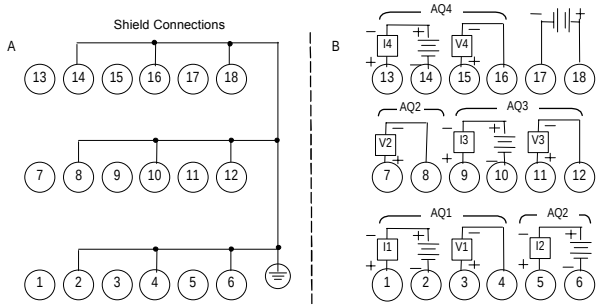
Current outputs act as current regulators and require a supply to power the load. The current loop can be connected either as a current source or as a current sink to the load.

The loads are isolated if the loop supply is isolated. However, if the module supply is also used as the loop supply, the loads are not isolated.

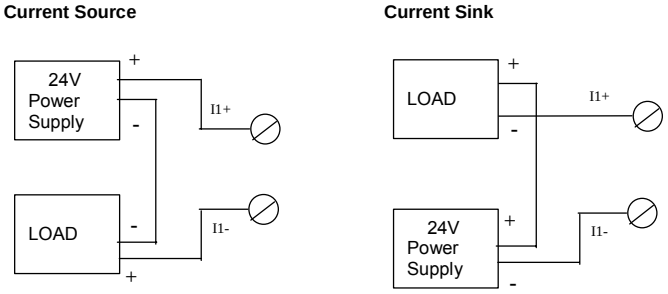
Wiring Connections for Carriers with Two Rows of Terminals



Wiring Connections for Carriers with Three Rows of Terminals



Wiring Examples



Cable Shield Connections

Shielded twisted pair cable is recommended for the analog channel connections.

If the module is installed on a Terminal-style I/O Carrier or a Compact Terminal-style I/O Carrier, the cable shield can be connected directly to the carrier.

If the module is installed on a Connector-style I/O Carrier, the cable shield can be connected directly to an Interposing Terminal. A shielded interposing cable (shielded cables are available separately) must be used between the Connector-style I/O Carrier and the Interposing Terminal.

An Auxiliary I/O Terminal Strip can also be added to the Interposing Terminal if additional shield connections are required.

Operating Note

If hot insertion of a module is done improperly, the operation of other modules on the same backplane may be disrupted. See *Installing a Module on a Carrier* in the *VersaMax Modules Manual,* GFK-1504.

Operating Notes

When a channel is configured for 4-20mA operation, the default value should be configured within the operating range. Otherwise, if the default value is left at zero, the module will report and under-range fault after the configuration download or any power cycle.

Compatibility

This module is compatible with:

- PLC CPU Firmware version 1.20 or later.
- Ethernet NIU EBI001 all versions.
- Genius NIU GBI001 Firmware version 1.10 or later*
- Profibus NIU PBI001 Firmware version 1.10 or later*
- DeviceNet NIU DBI001 Firmware version 2.10 or later

* For GBI001 and PBI001, NIU version 2.0 or above is required to perform software configuration.

Diagnostics

The module can detect and report the following faults:

Over-Range: The module reports an Over Range fault if an input value is greater than approximately +12.5 volts or 25 mA.

Under-Range: The module reports an Under Range fault if an input value is approximately 0mA on an current channel or –12.5 volts on a voltage channel.

Open Wire: The module reports an Open Wire fault on current inputs if the configuration of the low end of the range is greater than or equal to approximately 2.0 mA, but the input is not detecting current.

Loss of Field Power Supply: The module reports a Loss of Field Power fault if field power is not present (also indicated by the FLD PWR LED). Inputs default as specified by the configuration.

High Limit: The module reports a High Alarm fault if an input value is greater than or equal to the value specified by the "Alarm High" configuration parameter.

***Low Limit*:** The module reports a Low Alarm fault if an input value is less than or equal to the value specified by the "Alarm Low" configuration parameter.

Non-volatile Memory Fault: The module reports this fault only during field recalibration, if a non-volatile memory fault is detected.

Calibration

The module is calibrated at the factory. For most applications, no further calibration is required. It is possible to perform recalibration in either of the following ways:

- By changing a module's scaling so its scaled data agrees with metered values.
- By sending the module a recalibration message as described in the PLC User's Manual. Note that the module must be power cycled when reverting from field calibration back to factory calibration.

Output Defaults

The module requires both logic and module 24 volt power supplies to produce an output. Subsequent loss of power or communication will produce output states as determined by the configuration. These are:

Power and Configuration states	*Output Condition*
Field power, no logic power, not configured	All outputs 0
Field and logic power, not configured	All outputs 0
Field and logic power, configured	Outputs are scaled and follow program data
Module defaults due to loss of communications or other cause.	Outputs are set to configured default: value or Hold Last State. In I/O Station with NIU, outputs are set to 0.
Loss of backplane power after configuration	Outputs are set to Hold Last State if configured for Hold Last State operation, or to 0 if "default" was configured. A configured default value is not available to the module if backplane power has been lost. In I/O Station with NIU, outputs set to 0.
Communication returns without loss of Field Power	Outputs resume operation after configuration.

Configurable Features

The default parameters of this module can be used in many applications. The module can be software-configured when it is installed in a PLC system, or an I/O Station controlled by a Network Interface Unit that supports software configuration, as listed above.

The module is configured at startup. After configuration, the module begins providing signals from the voltage or current output devices connected to it to the CPU or NIU.

Parameter	*Description*	*Default*	*Choices*
Analog Input Data Reference	Starting offset for the module's analog input data.		user selectable
Analog Input Data Length	Word length of the module's analog input data.	8	0–8
Line Frequency	Specifies the line filter frequency.	60 Hz	50 Hz, 60 Hz
Report Faults	Enables or disables Fault Reporting for the entire Module.	Enabled	Enabled, Disabled
%AI Default / Hold Last State	Specifies whether the module will go to the specified channel defaults (see below) or hold their last states if power or communications are lost.	Default	Default /Hold
Current / Voltage	Specifies whether the channel will be a voltage or current input. If the Channel type is Current, the range is 4 to 20mA. If Channel type is Voltage, the range is –10 to +10V.	I (Current)	I (Current), V (Voltage)
Channel Active	Specifies if the channel should input data received from the CPU or NIU. If a channel is "inactive" space is still allocated for it.	Active	Inactive (off), Active (on)
Span Low	Actual current (in microAmps) or voltage (in milliVolts) to be scaled from low engineering units value.	4,000 µA	0 to 25,000 µA –10,000 to +10,000mV
Span High	Actual current in microAmps or voltage in millivolts to be scaled from the high engineering units value.	20,000 µA	0 to 25,000 µA –10,000 to +10,000mV
Engineering Low	The engineering units value that is considered equivalent to the low span (actual) value.	4000	0 to 25,000 µA –10,000 to +10,000mV
Engineering High	The engineering units value that is considered equivalent to the high span (actual) value.	20000	0 to 25,000 µA –10,000 to +10,000mV
Alarm Low	The low alarm limit for the channel, in engineering units.	4000	-32768 to +32767
Alarm High	The high alarm limit for the channel, in engineering units.	20000	-32768 to +32767
Default	The value to be input when the module is in a default condition.	0	-32768 to +32767

Description of Configurable Features

***Channel Active*:** Each channel can be configured as either active or inactive. If a channel is inactive, it is not scanned and a value of 0 is returned by the module.

Low Alarm Limit and High Alarm Limit: Each input channel can have a low alarm limit and a high alarm limit. If an input reaches one of its limits, the module reports the actual value and sends the appropriate diagnostic input bit. Alarms do not stop the process or change the value of the input.

Alarm limits can be set anywhere over the dynamic range of the signal. The range for each is –32,768 to +32,767. The high alarm limit must be greater than the low alarm limit. If alarm reporting is not wanted, alarm limits can be set beyond the dynamic range of the signal so they will never be activated.

Scaling: The module converts electrical signals (either current or voltage, as configured) into digital output values for the CPU or NIU. By default, the module converts this data from 1 millivolt or 1 microamp "internal units" for convenience in scaling and comparing to actual meter measurements.

The module's default scaling can be changed to tailor the data for a specific application. Typically, engineering units represent millivolts or microamps. But they may also represent physical units such as degrees or centimeters per second. When reconfiguring scaling, it is important to be sure that the chosen Engineering Units values would not result in Overrange or Underrange output levels.

The scaling for each channel can be configured independently. Scaling is configured by selecting corresponding low and high engineering units values and low and high span values for two points.

During operation, the module will use the straight line defined by these two pairs of configured scaling values to convert internal values to current or voltage signal levels that represent appropriate engineering units.

Fault Reporting: By default, the module is configured for fault reporting. The module reports faults as soon as they are detected. Once a fault has been reported, the same fault is not reported again until the fault has been cleared. Fault reporting can be disabled via configuration. If disabled, faults are not reported.

Configuring Scaling

The module converts digital output values received from the CPU or NIU to electrical signals (either current or voltage, as configured). By default, the module converts this data to 1 millivolt or 1 microamp "internal units" for convenience in scaling and comparing to actual meter measurements.

The module's default scaling can be changed to tailor the output data to a specific application. Typically, engineering units represent millivolts or microamps. But they may also represent physical units such as degrees or centimeters per second. When reconfiguring scaling, it is important to be sure that the chosen Engineering Units values would not result in Overrange or Underrange output levels.

The scaling for each channel can be configured independently. Scaling is configured by selecting corresponding low and high engineering units values and low and high internal values (counts) for two points.

During operation, the module will use the straight line defined by these two pairs of configured scaling values to convert internal values to current or voltage signal levels that represent appropriate engineering units.

Scaling Values for 1mV or 1μA Engineering Units

For many applications, the engineering units are either millivolts or microAmps. These units are easy to scale. Simply use the table below to find scaling values that are appropriate for the channel's configured range.

Examples	*Output Range*	*Enter this engineering units value*	*Span Units (microAmps)*
4 mA to 20 mA	4 mA 20 mA	Low +4,000 High +20,000	Low +4,000 High +20,000
-10 volts to +10 volts	0 volts +10 volts	Low 0 High +10,000	Low +4,000 High +20,000
0 mA to 20 mA	0 mA 20 mA	Low 0 High +20,000	Low 0 High +20,000
-10 volts to +10 volts	-5 volts +10 volts	Low -5,000 High +10,000	Low -5,000 High +10,000

Product Version Information

Rev	Date	Description
IC200ALG331-FB BXIOAO4215-FB	October 2008	Updated Power Supply OK signal circuitry.
IC200ALG331-EB BXIOAO4215-EB	July 2005	Improvement to latching mechanism
IC200ALG331-DB BXIOAO4215-DB	February 2005	Firmware revision 1.10. Fault reporting for active channels only.
IC200ALG331-DA BXIOAO4215-DA	April 2004	Changed to V0 plastic for module housing.
IC200ALG331-BA BXIOAO4215-CA	January 2004	ATEX approval for Group 2 Category 3 applications.
IC200ALG331-AA BXIOAO4215-AA	July 1999	Initial product release